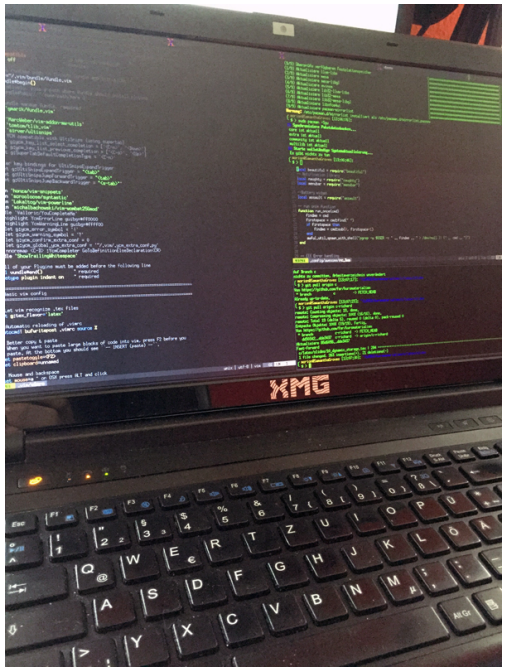
C introduction

Basic program structure

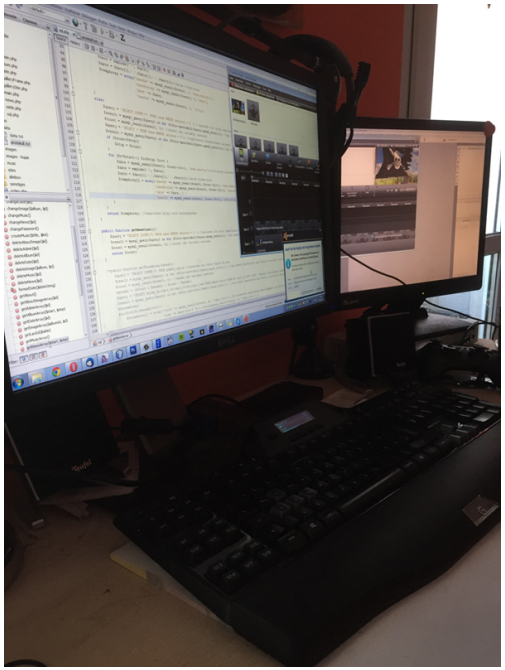
Richard Mörbitz, Manuel Thieme

Contents

OS's you may use



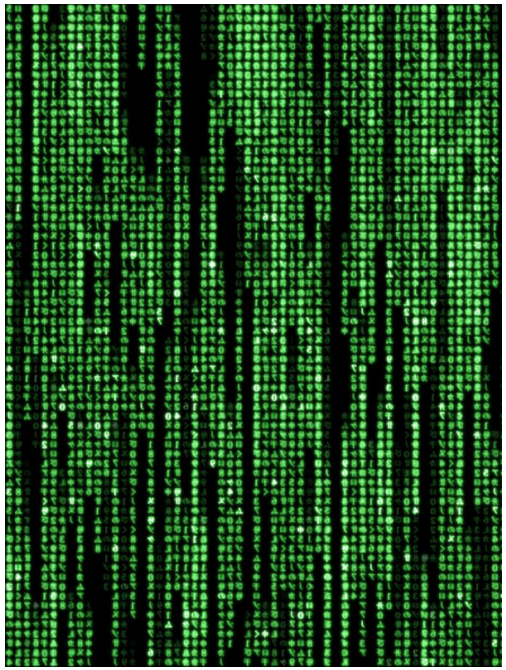
Linux



Windows

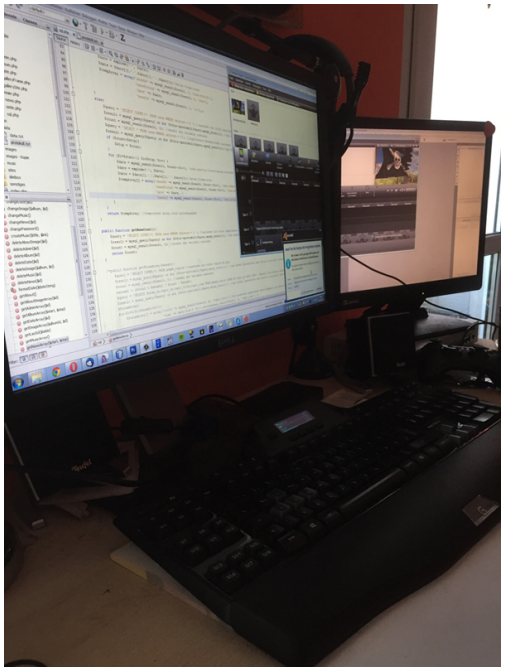
Mac OS X

OS's you may use

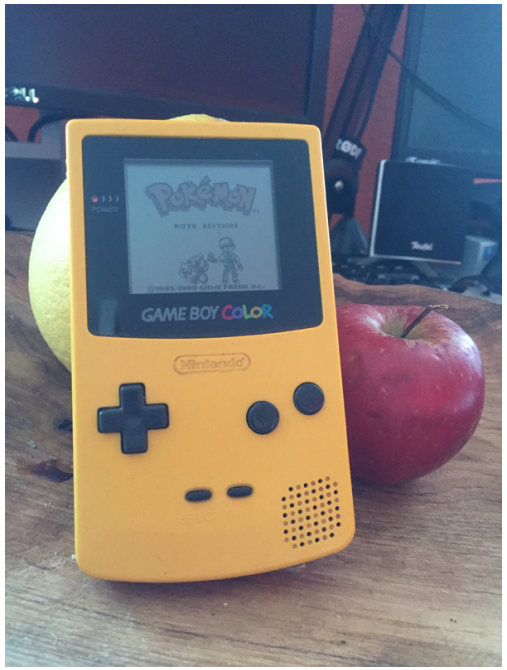


Linux

recommended

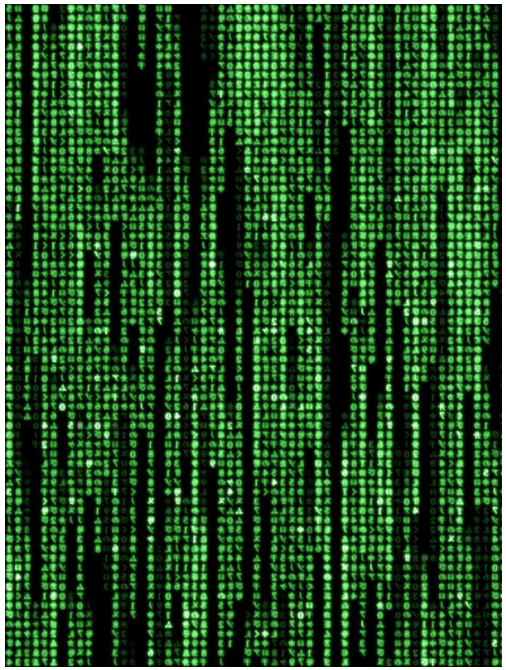


Windows



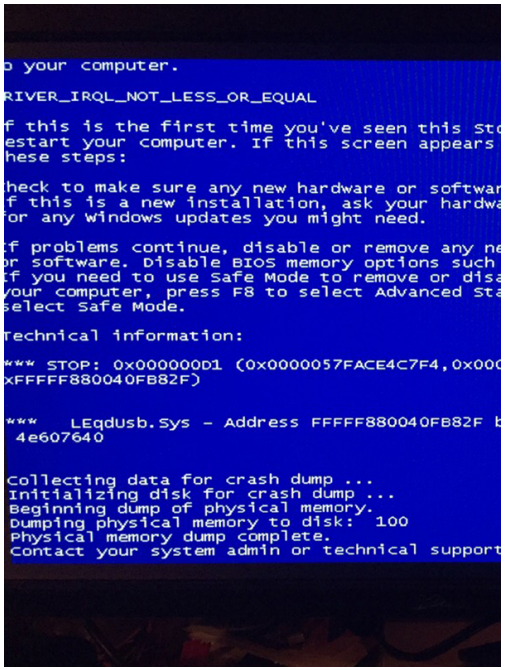
Mac OS X

OS's you may use



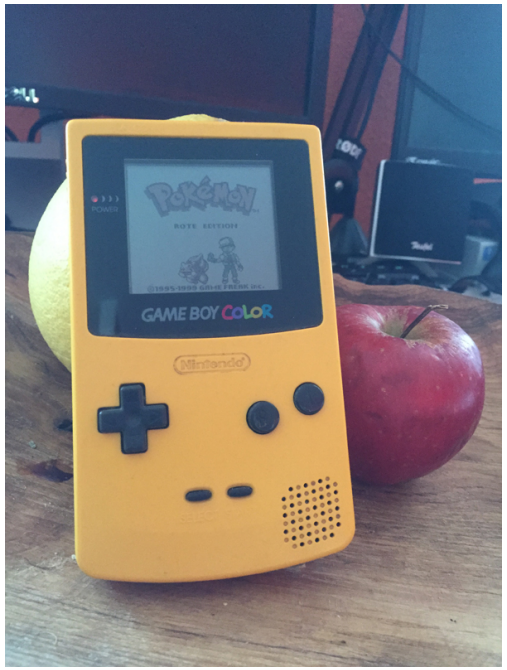
Linux

recommended



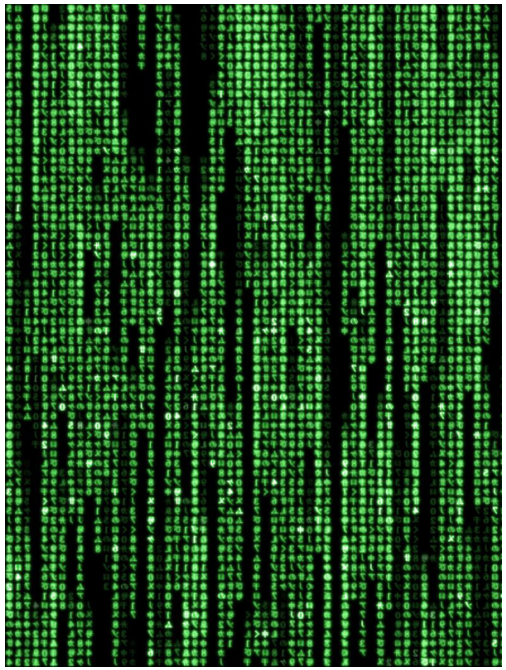
Windows

supported



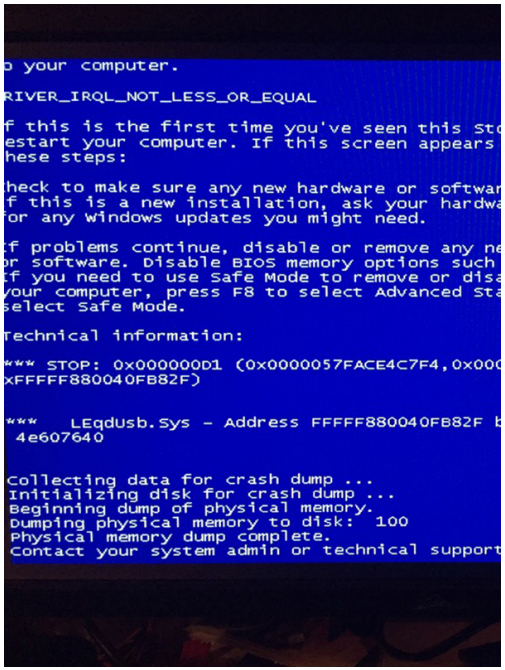
Mac OS X

OS's you may use



Linux

recommended



Windows

supported

~~Mac OS~~

Installing gcc on Linux

Ubuntu / Debian:

```
$ sudo apt-get install gcc
```

Arch:

```
$ sudo pacman -S gcc
```

... and you're done ;-)

cygwin

- Download installer from `https://cygwin.com/install.html`
- Run it
  - "Install from Internet"
  - Choose your installation path
  - Choose path for installation files
  - "Direct Connection"
  - Choose a mirror
  - Important software already is selected
  - **Optional**: powerful editor "vim" in *Editors*
  - **Recommended**: "GDB" in *Devel* and "libncurses-devel" in *libs* for the advanced course
  - Watching loading bars...
  - ???
  - Profit!
- Use cygwin-console like a linux terminal

The first program

- Create a new file named **main.c**.
- Open it in your text editor of choice.
- Fill it as follows:

```c
#include <stdio.h>

int main(void) {
    printf("Hello World!\n");
    /* Print "Hello World!" on the
       command line */
    return 0;
}
```

From source to bits

Source code

```
$ gcc main.c
```

(Preprocessing, compiling, assembling, linking)

Executable program

Linux (**a.out**)

```
$ ./a.out
```

Windows (**a.exe**)

```
$ ./a.exe
```

A basic program

```
1  #include <stdio.h>
2
3  int main(void) {
4
5      printf("Hello World!\n");
6      /* Print "Hello World!" on the
7         command line */
8
9      return 0;
10 }
```

} Preprocessor statements

} Main function

Preprocessor statements

- Processed before compilation
- Have their own language, start with a #

```
1 #include <stdio.h>
```

- Includes the *input/output header* from the **C standard library**
- Needed to use *printf()*

Preprocessor statements hace way more use cases, but they are very different from the actual C programming language.
In this course, we will use them for inclusions only.

The main function

- Basic function of every program
- Exists **exactly once** per program
- Called on program start

```
3 int main(void) {
```

- As a function, *main()* can take parameters and return a value
- Get used to *void* and *int*. They will be explained later
- '{' marks the start of the main function scope

The main function scope

- Contains program statements
- They are processed from top to bottom

```
9       return 0;
10  }
```

- Last statement, ends main function (and thus the whole program)
- *0* tells the OS that everything went right
- '}' marks the end of the main function scope

Statements

- Instructions for the computer
- End with a ; (semicolon)

```
5     printf("Hello World!\n");
```

- There is the empty statement:

```
      ;
```

- All statements are located in function blocks

Comments

- Information for the programmer, cut out before compilation

Single line comments:

```
6     // Print "Hello World!" on the command line
```

Block comments (mutli-line):

```
6     /* Print "Hello World!"
7        on the command line */
```

Better use of block comments:

```
6     /*
7      * Print "Hello World!"
8      * on the command line
9      */
```

A few words on style

- There can be multiple statements on one line
- Indentation is not nessessary at all

A few words on style

- There can be multiple statements on one line
- Indentation is not nessessary at all
- **But**...

```
#include <stdio.h>
int
main     (          void ){printf("Hello World!\n");
         // Prints
/*"Hello World!"                */
         return 0;}
```

Much more enjoyable

- Put each statement on a single line
- Indent every statement in the main function by one *tab* (you can also use *spaces*)
- Use /* ... */ rather than // ...
- Leave blank lines between different parts of the program
- Use *spaces* consistently to get clear code:

```
int main(void) {
    printf("Hello World!");
    /* Prints "Hello World!" */
    return 0;
}
```